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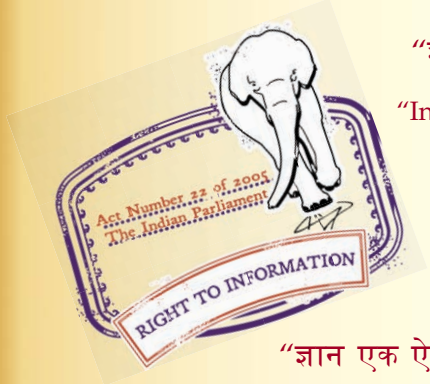

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SPECIFICATION FOR WOODEN LASTS FOR HEAVY-DUTY BOOTS

First Reprint AUGUST 1991
(Incorporating Amendment No. 1)

UDC 685.31.051.3

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *July* 1970

Indian Standard

SPECIFICATION FOR WOODEN LASTS FOR HEAVY-DUTY BOOTS

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Indian Standard

SPECIFICATION FOR WOODEN LASTS FOR HEAVY-DUTY BOOTS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 18 September 1969, after the draft finalized by the Footwear Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard has been prepared, basing its requirements on the lasts known in the trade as last No. 10883 and last No. 9150. Attempt has been made to rationalize these two lasts keeping in view the future trends of shoe making.

0.3 Although the Committee felt that for better fitting and foot health half sizes would have been a better solution, to avoid any deadlock in the utilization of present equipments and lasts, it recommended only fully sizes of lasts for the present. However, four different fittings have been prescribed in order to satisfy foot health requirements of the user.

0.4 The requirements for lasts specified in this standard with regard to species of wood to be used and permissible defects and moisture content in the finished lasts are in accordance with IS : 4512-1967* wherein a code of practice for the conversion, selection and seasoning of wood is also included.

0.5 Since the direct vulcanization and injection moulding process have come into vogue, the system of combining two fittings on one common insole has become very economical and rational. Considerable amount of saving in 'tooling cost' comes from using disc (pistons) and particularly side moulds, needed for these process; only separate metal (moulding) feet for two fittings are required. Even though fitting characteristics of footwear made through this system have been found satisfactory in some countries, the Committee decided not to prescribe this system in this standard at present.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Specification for footwear lasts, wooden.

†Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes the requirements, method of sampling **and** test for wooden hinged tests for heavy-duty boots.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definition given in IS : 2050-1967* shall apply.

3. REQUIREMENT

3.1 Materials

3.1.1 *Wood for the Last* — The following timbers shall be used:

a) **Sissoo** — *Dalbergia Sisso* Roxb., fam. Leguminosae,

b) **Himalayan maple** — *Acer* Sapp. fam. Aceraceae, and

c) **Pitraj** — *Amoora rohituka,* fam. Meliaceae.

NOTE — Various other timbers recommended in IS : 4512-1967† may also be used subject to agreement between the purchaser and the supplier.

3.1.1.1 In all cases, the wood shall have moisture content between 8 to 12 percent.

3.1.2 *Hinge Springs* — Having a nominal major axis of 53 mm and minor axis of 13 mm, made from 6 mm thick hard-drawn carbon steel wire conforming to Grade 2 of Sec 2 of IS : 4454-1967‡.

3.1.3 *Hinge Pin* — 6 × 45 mm, made from steel as prescribed in **3.1.2.**

3.1.4 *Bottom Full Plate* — Galvanized plate, 1 mm thick.

3.1.5 *Steel Tube* — Mild steel or sheet metal, II mm nominal internal bore and 40 mm nominal length and 1.5 mm nominal thickness.

NOTE — In trade, tubes are known as ' thimbles ' or ' sockets '.

3.1.6 *Nails*

3.1.6.1 *For fixing bottom full plate* — Panel pin nail, inverted cone shape, 1.8 × 20 mm.

3.1.6.2 *For fixing leather top or reinforcer* — Flat headed, round nails, 1 5 × 16 mm.

3.1.7 *Screws* — 12 mm 'ong, conforming to Variety No. 10 of IS: 451-1961§.

---

*Glossary of footwear terms.

†Specification for footwear lasts, wooden,

‡Specification for steel wire for cold formed springs.

§Spccification for wood screws (*revised*).

3.1.8 *Leather Top* — 4.5 to 5 mm thick, vegetable tanned hydraulic leather.

3.2 Construction and Finish — These shall be similar to the hinged lasts specified in IS : 4512-1967*.

3.3 Design Detail

3.3.1 *Insole Draft* — The size 8 Medium (G) insole of last shall be as given in Fig. 1. Other sizes and fittings shall be graded as indicated in Fig. 1. The details for the designing of the insole of last shall be as given in Appendix A.

NOTE — When considering the use of a common insole shape for two fittings, for the moulded process of manufacture, several facton should be taken into account:

a) A size 8 model last intermediate between the two fittings such as '*F*' fitting and '*G*' Fitting, with a joint (ball) girth of 245 mm, should be produced to give a '*F/G*' bottom pattern for these two fittings which should have common moulds based on this bottom pattern.'*F*' and '*G*' models should be made to give the desired joint (ball) girths on the '*F/G*' bottom pattern by the adjustment of the wood above the insole feather tine.

b) With one set of moulds covering two fittings, separate metal (moulding) feet for the two fittings may be used. The side moulds and sole mould only should be common to the two fittings.

c) The initial last itself, when modelled, should have an adequate amount of 'overhang' around the sides. This feature facilitates the subsequent modelling of the other fittings by the addition or substraction of 'top wood' and 'side wood' (*see* Fig. 2).

3.4 Dimensions of Last

3.4.1 The length, size, widths, and fittings of the last shall be as given in Table 1.

3.4.2 There shall be four widths for the fittings of the last as designated by following letters:

Small = S
Medium = M
Large = L
Extra Larse = EL

4. MARKING

4.1 On all lasts, on the outer side of the heel portion, the size of the last, designation of fitting (*see* **3.4.2**) and the name of manufacturer, or trademark shall be clearly marked.

*Specification for footwear lasts, wooden.

TABLE 1 STANDARD DIMENSIONS OF LAST

(*Clause* 3.4.1)

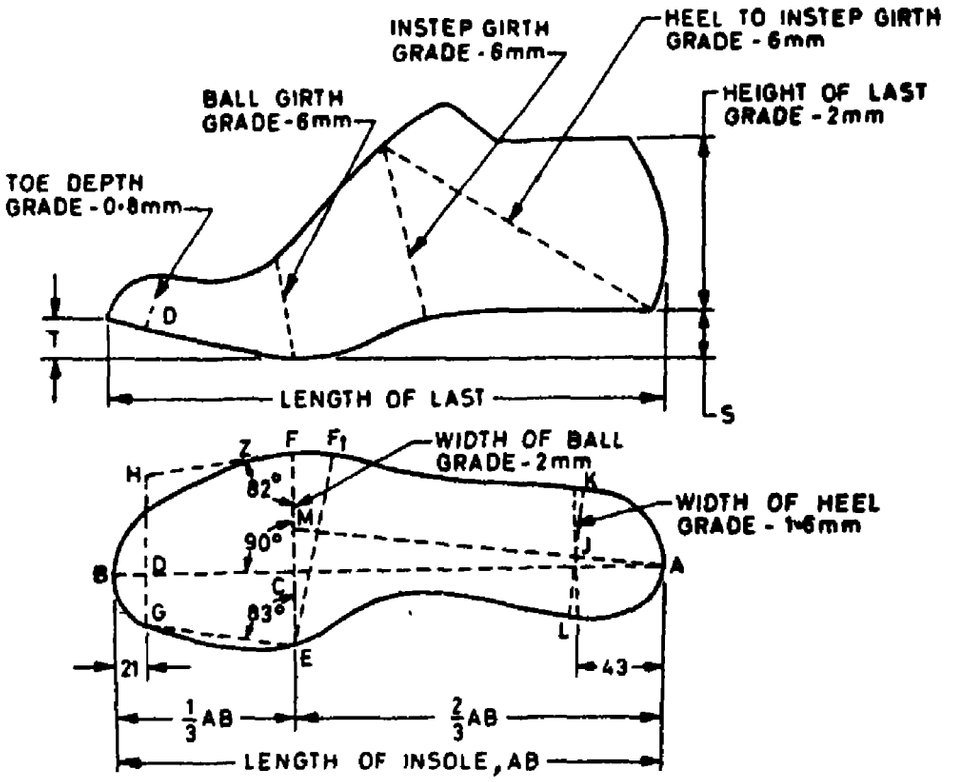
FOOT LENGTH IN SIZE STICK* (1)	BOOT SIZE (2)	LENGTH OF LAST IN SIZE STICE† (3)	FITTINGS (4)	WIDTH OF BALL (5)	WIDTH OF HEEL (6)	GIRTH OF BALL (7)	GIRTH OF INSTEP (8)	TOE DEPTH (9)	HEIGHT OF LAST INCLUDING LEATHER TOP (10)
228-235	4	250	SS M L EL	85 87 89 91	58 59 60 61	218 224 230 236	224 230 236 242	21	70
236-243	5	259	S M L EL	87 89 91 93	59 60 61 62	224 230 236 242	230 236 242 248	22	72
244-251	6	267	S M L EL	89 91 93 95	60 61 62 63	230 236 242 248	236 242 248 254	23	74
252-259	7	276	S M L EL	91 93 95 97	61 62 63 64	236 242 248 250	242 248 254 260	24	76
260-267	8	284	S M L EL	93 95 97 99	62 63 64 65	242 248 254 260	248 254 260 266	25	78

268-275	9	293	S M L EL	95 97 99 101	63 64 65 66	248 254 260 266	254 260 266 272	26	80
276-283	10	301	S M L EL	97 99 101 103	64 65 66 67	254 260 266 272	260 266 272 278	27	82
284-291	11	310	S M L EL	99 101 103 105	65 66 67 68	260 266 272 278	266 272 278 284	28	84
292-299	12	318	S M L EL	101 103 105 107	66 67 68 69	266 272 278 284	272 278 284 290	29	86

All dimensions in millimetres except col 2.

*Half sizes are not included.

†This is the leangh measurement of a full bottom plated last, whose 0.5 mm allowance is provided all round, plates.



S = Height of the heel = 30 mm

T = Toe spring = 20 mm

All dimensions in millimetres.

FIG. 1 INSOLE SHAPE OF LAST

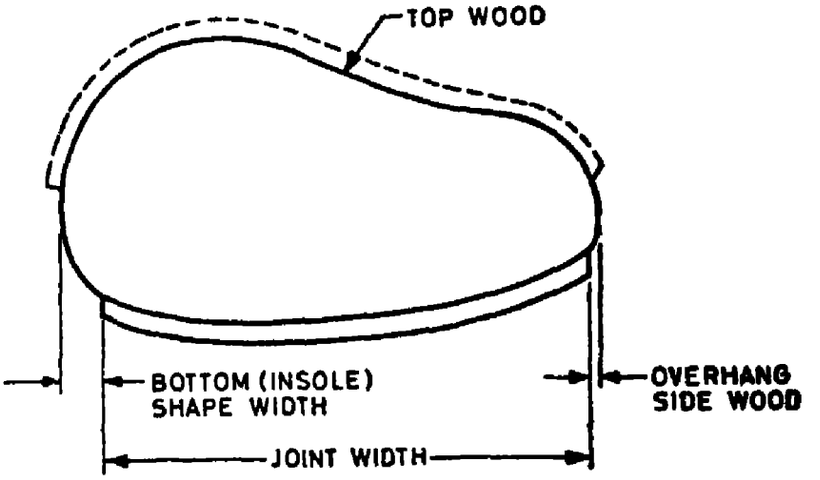


FIG. 2 SECTION OF LAST AT JOINT (BALL) POSITION

4.1.1 The last may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. PACKING

5.1 Lasts shall be packed in boxes made of wooden planks in conformity to the requirements prescribed below.

5.1.1 Boxes shall be lined with wrapping paper (waterproof) and layer of soft, dry paper or wood shavings along the bottom and the sides. The lasts shall be packed tightly in rows, in such a way that metallic parts of the lasts come opposite to one another. The space between individual lasts shall be filled with paper or dry shavings. On the lasts packed in this way a second layer of dry shavings or paper shall be spread and in the same order a second row shall be packed. In this way packing shall be continued further till the box is filled with lasts up to the upper edges. The top row of lasts shall be covered with a layer of dry shavings or by wrapping paper.

5.1.2 Nails, fixing the cover lid, shall be correctly driven in and shall not come out from the boards on the inner or outer surface of the box.

6. SAMPLING AND CRITERIA FOR CONFORMITY

6.1 For the purpose of ascertaining the conformity of the wooden lasts for heavy-duty boots to this specification, the scale of sampling and criteria for conformity shall be as given in Appendix B.

7. TEST METHODS

7.1 Visual characteristics shall be checked in accordance with model or ordered specimen.

7.2 Dimensional Characteristics

7.2.0 Check-up of lasts shall relate to the following dimensions, measurements and various control patterns and gauges.

7.2.1 Determine the length of the lasts by size-stick; the proportions for the contiguous sizes is based on the given standard length for each heel height.

7.2.2 To ensure that the longitudinal and transverse sections, as well as heel parts and bottom shape of any size in a set of lasts agree with the specifications for shape and measurements, use graded insole patterns and various graded control profiles including back curve of the heel, toe profile for the entire size range.

NOTE — The patterns for insole and profile shall be cut to the master or model size, from which remaining sizes shall be graded. It gives length, shape, width of the forepart and seat, and to this extent it is suitable for testing the lasts. Grades are fixed arbitrarily and adopted by custom in the last industry.

7.2.2.1 On superimposition, the profile pattern of the longitudinal bottom section (generally called ' bottom profile ') shall coincide with the axis of the last along with the contour of the heel back curve.

7.2.2.2 On superimposition, the profile section of the longitudinal toe section (generally called ' toe profile ') shall coincide with the longitudinal axis of the body of the last in its upper forepart.

7.2.3 Carry out measurement of the last by standard last measuring tape (a tape of non-variable dimensions with fine metallic wire inside); the width of the tape shall not be more than 10 mm.

7.2.3.1 During measurement of the joint and instep girth, lay the measuring tape on the last in such a way, that the measuring edge of the tape fits closely and lies fiat on the last along the line of measurement.

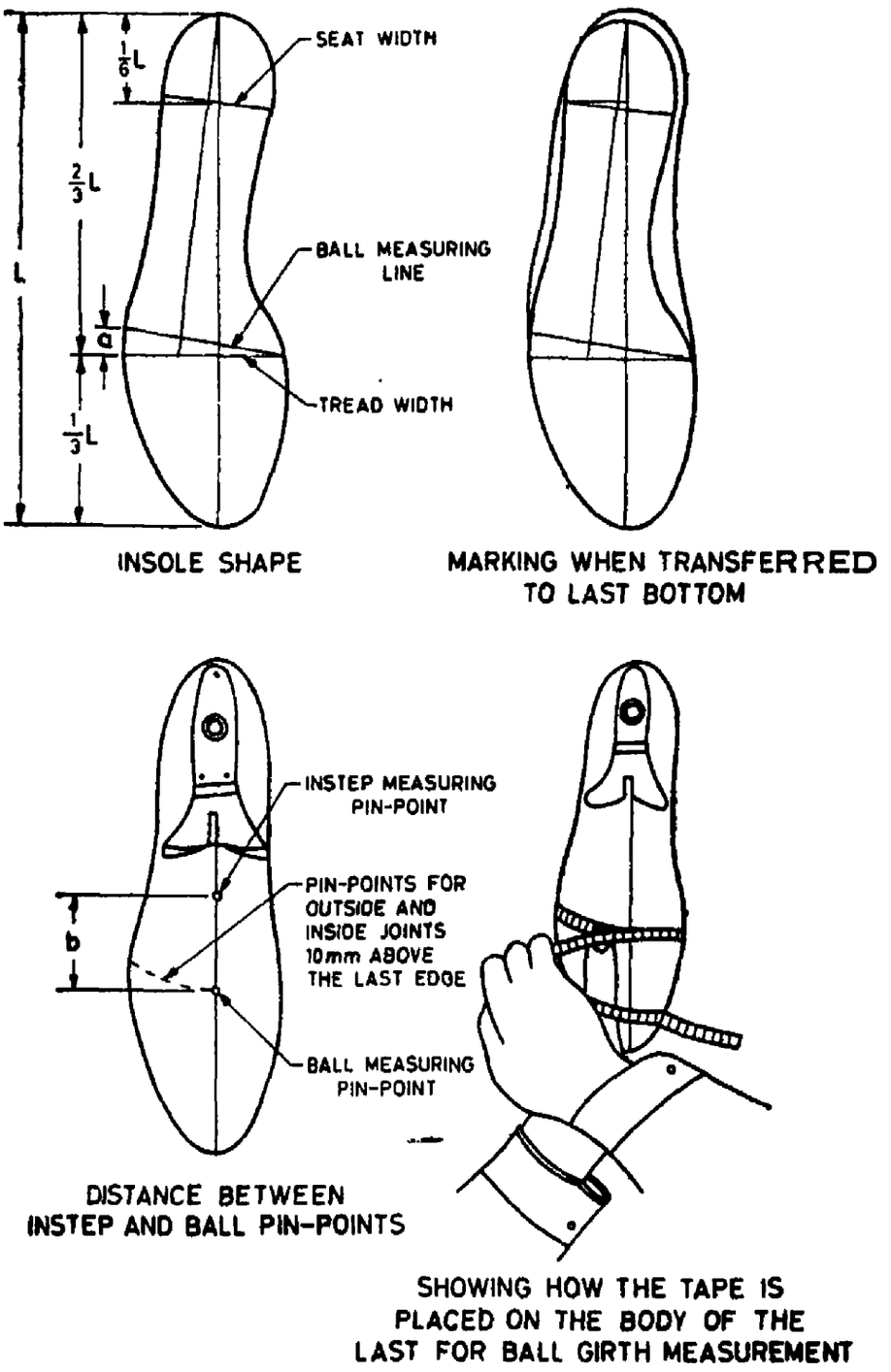
7.2.3.2 During measurement of instep girth of the lasts, the measuring edge of the tape of the comb shall come in contact with the marked point. Near the bottom, the tape shall settle in the most concave part of the last in such a manner as to give during this measurement of the last the smallest size.

7.2.4 Determine the location of the joint measurements by the model markers.

NOTE — It is impossible to prescribe a fixed standard for location of the joint measurements. The difficulty of uniform location is due to the curved surfaces and varying shapes of lasts. This problem of specifying the exact location of the joint girth has been disputed with the last making and footwear industry since early craft days and remains unsolved. Various forms of apparatus for location of joint and instep has been made but they are not in general use.

7.2.4.1 An approximate position for location of the ball and instep girth measurement in insole pattern is shown in Fig. 3. This system requires little skill and may be performed very easily without the help of any apparatus and as such may be considered as standard practice under the existing conditions.

NOTE — Although the joint girth measurement is taken diagonally in a transverse direction, but makers of lasts take this measurement at arbitrary points to enable them to place the measuring tape flat to the wood of the last. Generally this takes in either the inside or outside joint, but never both.



a = Maximum distance between ball measuring line and tread width = 20 mm

b = Distance between instep and ball pin-points = 60 mm

L = Standard length of insole

FIG. 3 LOCATION OF GIRTH MEASURING POINTS

7.2.5 Following the system described above, check the correctness of position of pin-points in this manner; the bottom of the last, the insole, checked by marked lines is superimposed, so that, starting from the toe part, it coincides all over with the bottom of the last.

7.2.5.1 Pin-points at the joints (inside and outside) shall be exactly located on the last at the ends of lines above the contour (feather edge) of the lasts at a distance of 10 mm.

7.2.5.2 Correctness of the position of the pin-points located on the body of the last at the base of the instep (along with centre line of the last) is checked either by the measuring tape with the help of two pin-points of the joints for measurement of the ball girth; or by the longitudinal front profile which with the mark point is put on the last and the coincidence of the pin-point on the last with the point of the profile is observed.

7.2.6 For the determination of the correctness of the position of the pin-point for measurement of instep girth on the cone of the last the following method is recommended.

7.2.6.1 This position is represented on the last, along the middle of the cone, at a distance of 60 mm above the ball joint pin-point which is located at the base of the instep (cone) (*see* Fig. 3).

7.2.6.2 To ascertain the girth of the instep, the tape shall lie fiat and close to the last on the selected points.

NOTE — Like the joint measurement the instep measurement may not also be located exactly by rule. Half standard length of the last (excluding the difference between the length of the insole and the foot), on an imaginary line through the length may be given as the approximate position. The largest girth at that point probably answers the purpose best.

7.2.7 *Check-up of the Insole Pattern of Medium Size* — In order to check the basic dimensions of the insole, it is necessary to determine the position of points of measurement.

7.2.7.1 Determine position of measurement by a special pattern or template, the construction of which is given in Fig. I and Appendix A.

7.2.7.2 Test beforehand carefully graded patterns of insole, profile templates of longitudinal and transverse sections, used for check up for the lasts.

NOTE — The actual or stick-length of last may vary from the standard length of insole pattern as it frequently does. The insole length shall be always 2 to 3 mm shorter than the stick-length by virtue of the back curve protruding behind it. The accepted stick-length of a last is the distance from the centre of the curve at the back to the extreme tip of the toe. The actual size-stick length is not to be used to denote the foot fitting length of a last. For any given shoe or last size, the foot shall be shorter than the insole by at least 10 mm when measurement is taken in a fitting position.

7.2.8 Check the height ot the last and the dimensions of the tube by callipers.

7.2.9 Measure height of quarter pin mark or vamp mark by tape or by a gauge.

7.2.10 *Measurement of Heel Height* — Place the last on a level surface. Raise the seat of the last until the tread line touches the level surface. Then measure the heel height from the scat position to the level surface. Take care that the scat of the last rests almost parallel to the ground.

7.2.11 For all sizes and fittings, the height of the heel of the last shall be 30 mm and the toe spring shall be 20 mm.

7.3 Moisture Content — To determine the moisture content, sample pairs shall be drawn at random from those already tested (*see* **B-2.1.3.1**) in accordance with col 4 and 6 of Table 2. From the middle of the selected lasts a piece of wood is cross cut and tested by timber moisture meter or by oven drying method.

7.4 Mechanical and Other Requirements — Following items shall be tested for mechanical and other requirements by cutting or opening up the lasts:

a) Dimensions of the tube.

b) Proper fitting of the tube,

7.4.1 Measuring the position of the tube vertical to the surface of the heel.

7.4.2 Carry out test of the metallic components as per the details given under requirements.

APPENDIX A

(*Clause* 3.3.1)

DESIGNING OF INSOLE DRAFT

A-1. DIRECTIONS FOR THE DESIGN

A-1.1 The design of insole of last and its shape shall be as given in Fig, 1 with the constructional details given below:

AB = Absolute insole length

AD = Foot sole length

BD = Absolute addition

C = Intersection of the joint measuring line with the middle line. AC = 2/3 of AB. Draw transverse line ECF through C making an angle 90° with AB (EF = width of ball or tread width). FF_1 = 2 cm.

$\angle EFF_1$ = 90°. Take the ball measurement by tape along EF_1 line.

J = Point forthc heel measuring line. AJ = 1/6 of AD (LK = width of heel) and depends on fitting.

M = Draw line through J from A at a distance of 15 mm from C on the ball line EF. This is the axis of symmetry for heel end.

$\angle CEG$ = Big toe angle. Draw at E in the toe direction marking an angle with EF equal to 83°. This line intersects the transversal through D at the point G.

$\angle CFH$ = Small toe angle. Draw at F in the toe direction marking an angle with EF equal to 82°. This line intersects the transversal through D at the point H.

Z = Small toe point. This point is marked on FH, such that FZ = 10 percent of AD.

D = Toe height (with bottom iron plated last). The height of toe is the same for all widths.

S = Height of the heel = 30 mm.

T = Toe spring = 20 mm.

APPENDIX B

(*Clause* 6.1)

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

B-1. SAMPLING OF FOOTWEAR LASTS

B-1.1 Lot — All last pairs in a consignment of the same style, type, size and fitting and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

B-1.2 For ascertaining the conformity of the lot to the requirements of this specification, tests shall be carried out for each lot separately. The number of last pairs, to be drawn from any lot shall depend on the size of the lot and shall be in accordance with col 1 and 2 of Table 2.

B-1.3 Such pairs shall be selected at randon from the lot and in order to ensure the randomness of selection, a random number table

TABLE 2 SCALE OF SAMPLING

(*Clause* B-l.2)

NO. OF LAST PAIRS IN THE LOT	VISUAL CHARACTERISTICS		DIMENSIONAL CHARACTERISTICS		MOISTURE CONTENT AND DESTRUCTIVE TEST REQUIREMENTS ON COMPONENTS, SAMPLE PAIRS
	Sample Pairs	Permissible No. of Defectives	Sample Pairs	Permissible No. of Defectives	
(1)	(2)	(3)	(4)	(5)	(6)
Up to 20	All	0	5*	0	†
21 „ 50	20	1	8	0	1
51 „ 100	32	1	13	0	2
101 „ 300	50	3	20	1	3
301 „ 1 000	80	5	32	1	5
1 001 „ 3 000	125	7	50	2	6
3 000 and above	200	10	80	3	8

*All if the number in the lot is less than 5.

† As agreed to between the purchaser and the supplier.

(*see* IS : 4905-1968*) shall be used. In case such a table is not available, the following procedure shall be used:

Arrange all the pairs in the lot in a systematic manner and starting from any pair, count them as 1, 2, 3, ..., up to r and so on in one order, where *r* is the integral part of *N*/*n* (*N* being the total number of pairs in the lot and *n* being the number of pairs to be selected in the sample). Every *r*th pair thus counted shall be withdrawn to give sample for test.

B-2. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-2.1 Number of Tests

B-2.1.1 *Defective Last* — A last which has one or more defects with respects to a quality characteristic under consideration shall be considered a defective last.

B-2.1.2 All the pairs selected under **B-1.3** shall be first examined for visual characteristics. If the number of pairs failing to satisfy these requirements for each characterisdcs is less than or equal to the corresponding permissible number of defectives given in col 3 of the Table 2, the lot shall be declared to have satisfied the requirements for these characteristics. If,

*Methods for random sampling.

however, the number of defective pairs exceeds the permissible number. the lot shall be considered as not conforming to the requirements for these characteristics.

B-2.1.3 *Dimensional Characteristics* — The lot which has been found satisfactory as in **B-2.1.2** shall next be tested for dimensional characteristics.

B-2.1.3.1 The pairs for this purpose shall be taken from those already drawn (*see* **B-1.3**) in accordance with col 2 and 4 of Table 2. These pairs shall be taken at random and tested for the dimensional characteristics as specified in the relevant clauses. If the number of pairs failing to satisfy the requirements for these characteristics is less than or equal to the corresponding number given in col 5 of Table 2, the lot shall be declared to have satisfied the requirements for these characteristics, otherwise not.

B-2.1.4 *Moisture Content and Requirements on Components* — The lot having been found satisfactory for dimensional characteristics (*see* **B-2.1.3**) shall be finally tested for the moisture content and the dimensional and the mechanical properties of the components by opening up of the lasts. For this purpose, the pairs shall be drawn at random from those already tested (*see* **B-2.1.3.1**) in accordance with col 2 and 4 of Table 2. These pairs shall then be opened up and tested for moisture content, dimensional and mechanical characteristics of the components.

NOTE — For the analysis mentioned above, the test sample may be prepared by cutting both the units in a pair.

B-2.1.4.1 The lot shall be considered to have satisfied the requirements of moisture content, dimensional and mechanical characteristics of the component parts if the selected pairs pass all the tests prescribed for these properties.

B-2.2 Criteria for Conformity

B-2.2.1 The lot shall be declared as conforming to all the requirements of this specification if it passes in **B-2.1.1, B-2.1.2 B-2.1.3** and **B-2.1.4**.

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Printed at Dee Kay Printers, New Delhi, India